Nº 2130

HIGH SCHOOL AND UNIVERSITY
MATRICULATION EXAMINATIONS BOARD

DEPARTMENTAL EXAMINATIONS, 1937

CHEMISTRY 1

Time—2½ hours.

Note—Eight questions constitute a full paper.

Answer *Question* 1 and *any other seven* questions.

Where diagrams are used, they should be neatly drawn and sufficiently large to show all necessary details.

In problems, show all steps in full; calculate results to one decimal place.

Atomic weights: Fe = 56; H = 1; Mn = 55; N = 14; Mg = 24; Cl = 35.5; O = 16; P = 31.

Values

1. (*a*) Numbering the subsections as indicated below, supply *only* the missing parts.

2 (1) The chemical substances required to produce calcium cyanamide are .... and ....

1 (2) .... formulated the Atomic Theory.

1 (3) The chemical action expressed by anhydrous copper sulphate + water → blue vitriol, is known as ....

1 (4) The chemical name for washing-soda is ....

1 (5) The solubility of carbon dioxide in water varies .... as the pressure.

2 (6) The following equation indicates the preparation of nitric acid: .... + ... → .... + ...

2 (7) *Four* products derived from petroleum are ...., ..., ..., and ....

2 (8) .... + ... → .... + ... is the equation for the reaction which occurs when hydrogen peroxide is prepared.

Values

(*b*) Numbering the subsections as indicated below, state in a few words *one* result which should be observed in each of the following experiments:

1 (1) A piece of blue litmus paper is moistened and dropped into a jar of chlorine.

1 (2) Hydrogen sulphide is passed into a solution of lead nitrate.

1 (3) A filter paper soaked with turpentine is dropped into a jar of chlorine.

1 (4) Solutions of barium chloride and sodium sulphate are mixed.

8 **2.** (*a*) Explain and illustrate each of the following terms:

(1) compound.
(2) oxidation.
(3) neutralization.
(4) dissociation.

2 (*b*) Name and state the law which the following experiments illustrate:

(1) 10 litres of hydrogen react with 5 litres of oxygen.

(2) 2 litres of hydrogen sulphide react with 3 litres of oxygen.

(*c*) State:

1 (1) the Law of Conservation of Weight.

1 (2) the Law of Definite Proportions.

5 **3.** (*a*) Describe experiments to prove that manganese dioxide acts as a catalyst, when used in the production of oxygen from potassium chlorate.

3 (*b*) Describe the technique for cutting and bending glass tubing.

(*c*) Describe a laboratory test for each of the following:

2 (1) ammonium compounds.

2 (2) nitrates.

12 **4.** Discuss the progress made in the study of burning substances which led to the modern conception of combustion.

8 **5.** (*a*) Describe, with the aid of a *labelled* diagram, an experiment to show how hydrogen may be prepared, dried, and used as a reducing agent.

Values

4 (*b*) Write equations to indicate each of the chemical reactions which take place in the experiment in (*a*).

5 **6.** (*a*) Write the chemical formulae for the following substances: silver carbonate, mercuric nitrite, barium phosphate, aluminium carbide, chlorous acid.

4 (*b*) Give the chemical name for the compound represented by each of the formulae: $(NH_4)_2S$, $FeBr_3$, H_3PO_3, $NaClO$.

3 (*c*) Calculate the percentage of oxygen in ferrous nitrate, $Fe(NO_3)_2$.

4 **7.** (*a*) A mixture of common salt and sulphuric acid is heated in a generator and the gas produced is dried and passed over hot sodium in a combustion tube.
Write equations for the reactions which take place in the above experiment.

$NaCl + H_2$
Na_2SO_4

4 (*b*) (1) How many grams of chlorine are produced by acting on 174 grams of manganese dioxide with hyrochloric acid?

4 (2) How many litres would this chlorine occupy at 17° C. and 580 mm.?

8. (*a*) Write equations for the chemical reactions which occur in the following experiments:

2 (1) Hydrochloric acid acts on marble chips.

$2HCl + CaC$
$CaCl_2 +$
$+ H$

2 (2) Calcium carbide is placed in water.

2 (3) A solution of sodium bisulphite is allowed to drip into sulphuric acid.

2 (4) A mixture of ammonium chloride and sodium nitrite is moistened and heated.

4 (*b*) Give *one* important use for each of the following: chlorine, carbon dioxide, calcium oxide, sodium bicarbonate.

5 **9.** (*a*) Find the simplest formula for the substance whose composition by weight is:

magnesium = 21.62%
phosphorus = 27.93%
oxygen = 50.45%

2 (*b*) Define the term "gram molecular weight".

5 (*c*) Describe experiments to identify each of the following gases:

nitric oxide, ammonia, oxygen, nitrous oxide, carbon dioxide.

[OVER]

Values

2 **10.** (*a*) By referring to sulphur explain what is meant by the term "allotropy".

4 (*b*) Show by a *labelled* diagram *only,* the apparatus, materials, and method used to prepare and collect a jar of hydrogen sulphide.

2 (*c*) Describe how to identify a sulphite.

4 (*d*) By means of simple experiments indicate four properties which all acids possess.

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